Climate Change in California:Choosing our Future

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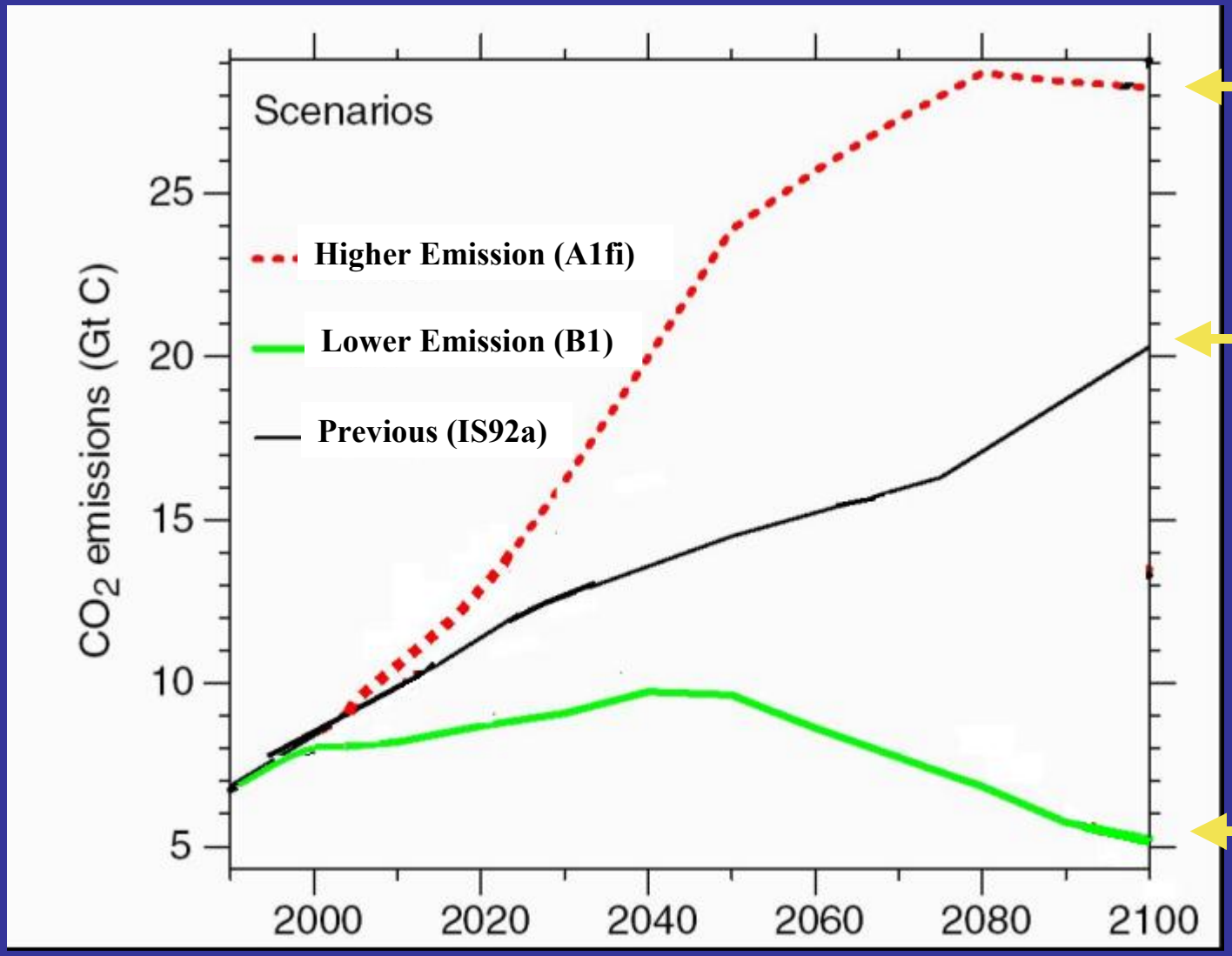
Climate Change in California

New Projections

- What are the consequences of following markedly divergent emissions pathways?
  -- for temperature and precipitation
  -- for key climate-sensitive sectors

Global Emissions Scenarios

Intergovernmental Panel on Climate Change (IPCC)



Higher

Previous

Lower

Temperature Projections

(change in temperature °F)

HADCM3

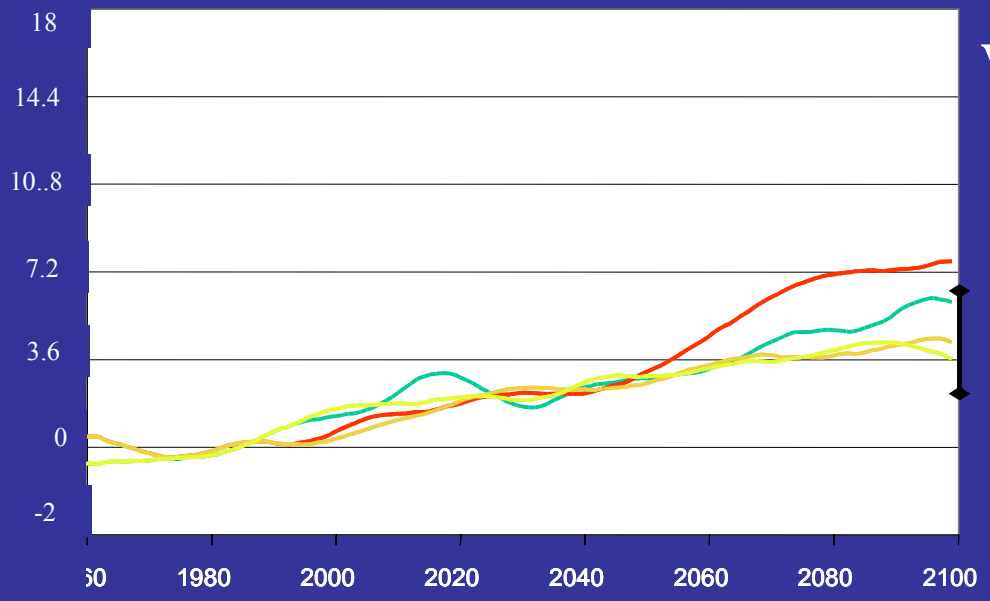
Low

High

PCM

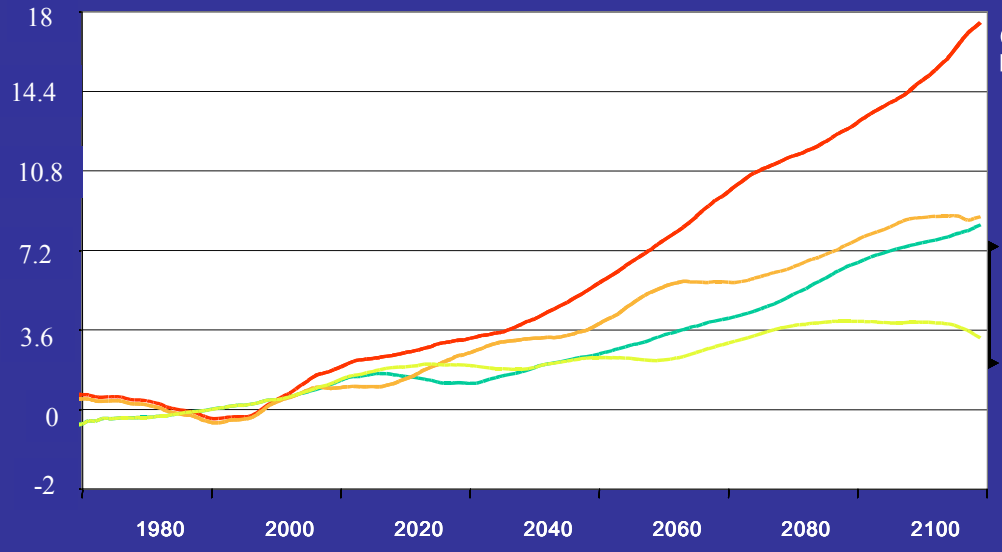
Low

High



WINTER

Previous Midrange Projections

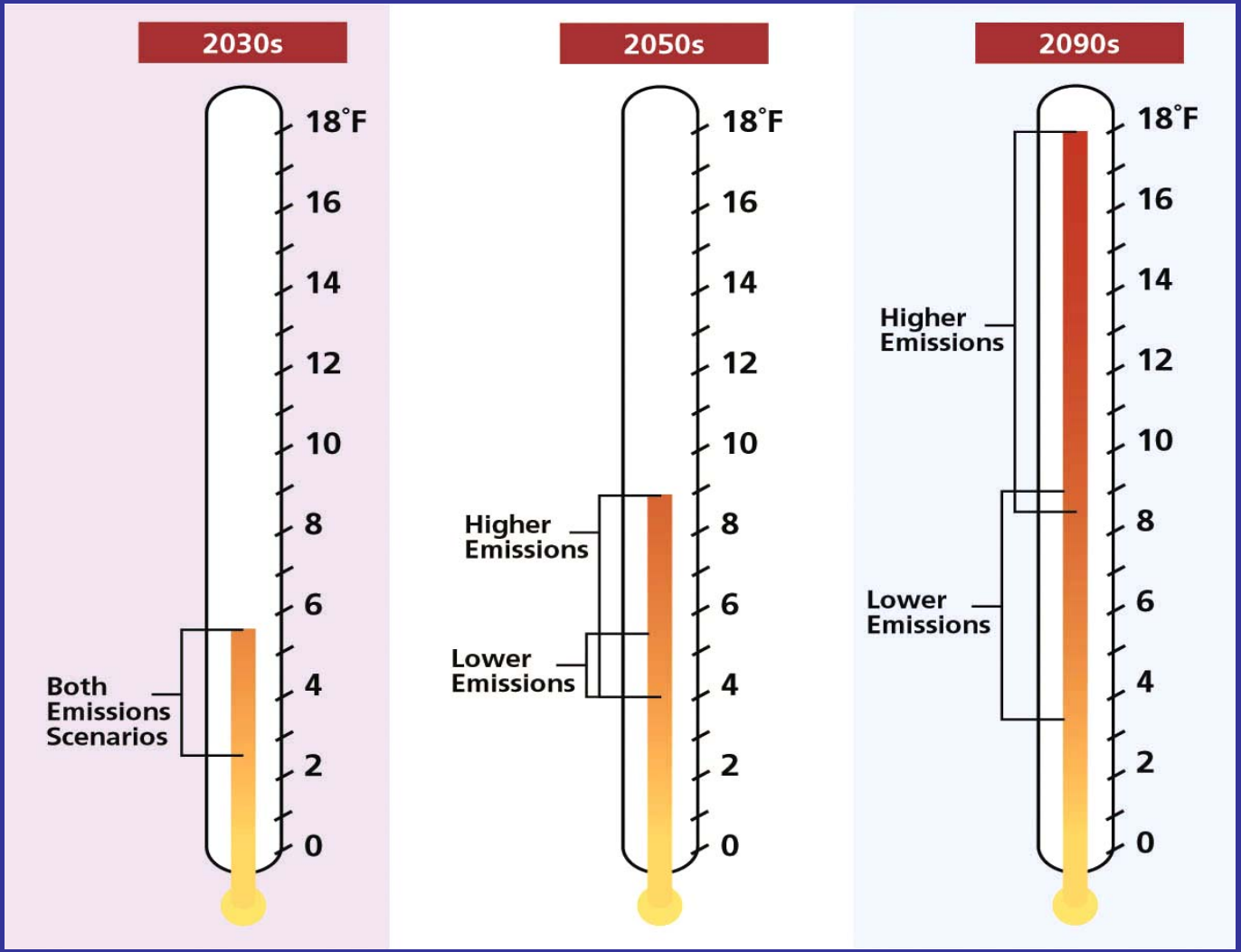


SUMMER

Previous Midrange Projections

Rising Temperatures

California statewide
Projected changes in average summer temperature

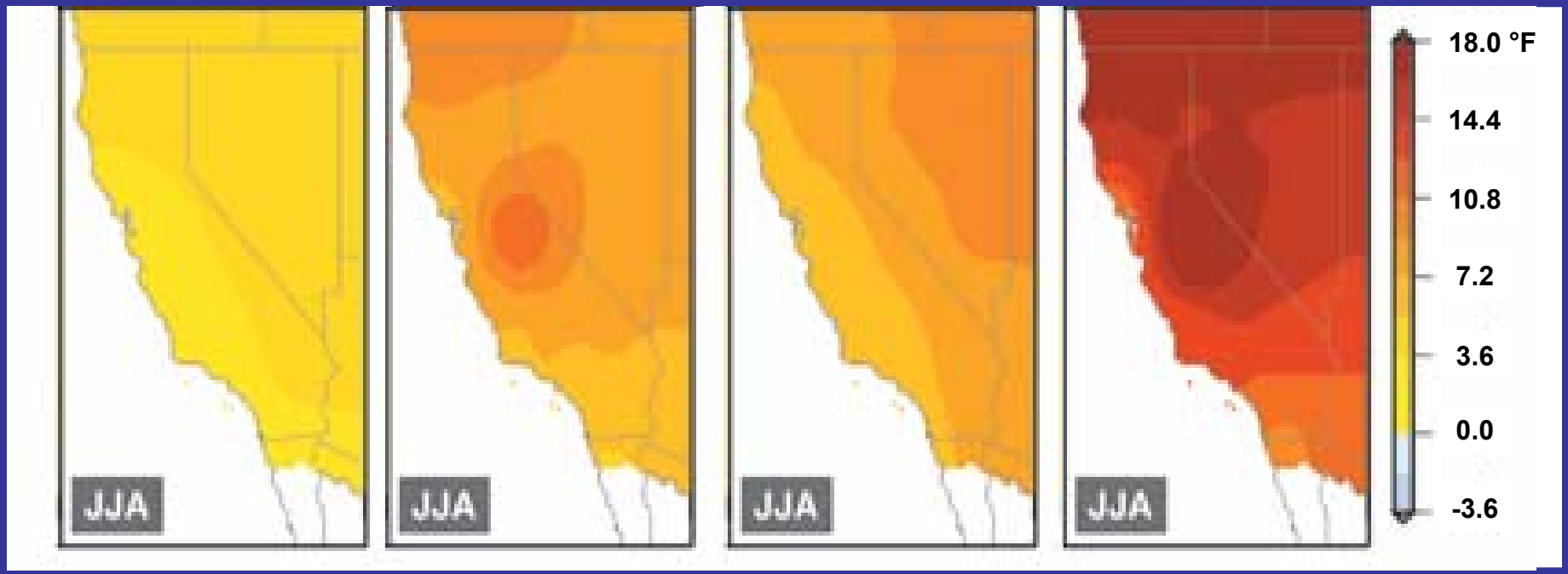


Patterns of Temperature Change

2070-2099 relative to 1961-1990

Summer

LOWER EMISSIONS **HIGHER EMISSIONS**

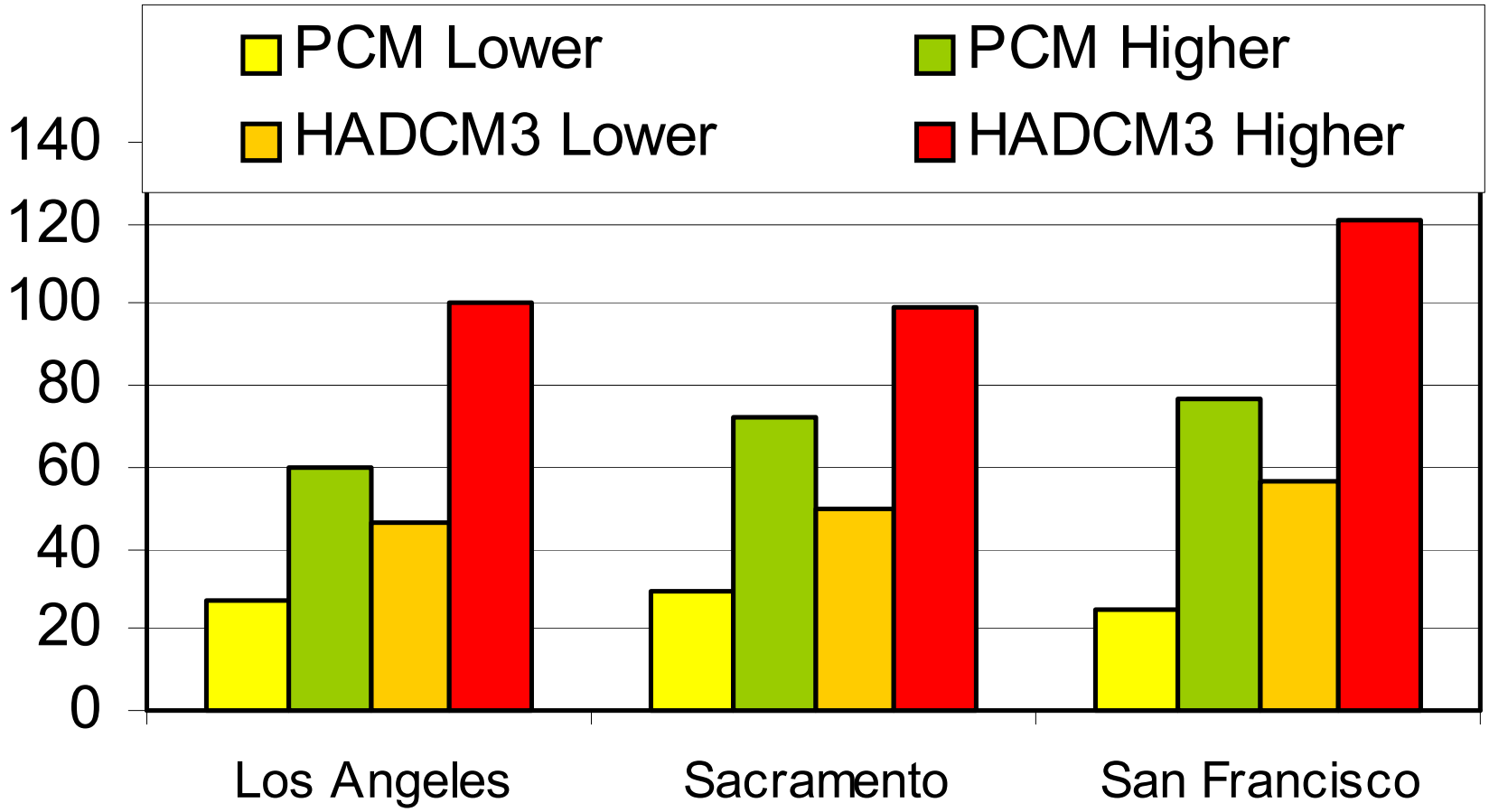


PCM lower HadCM3 lower PCM higher HadCM3 higher

Increasing Heatwaves

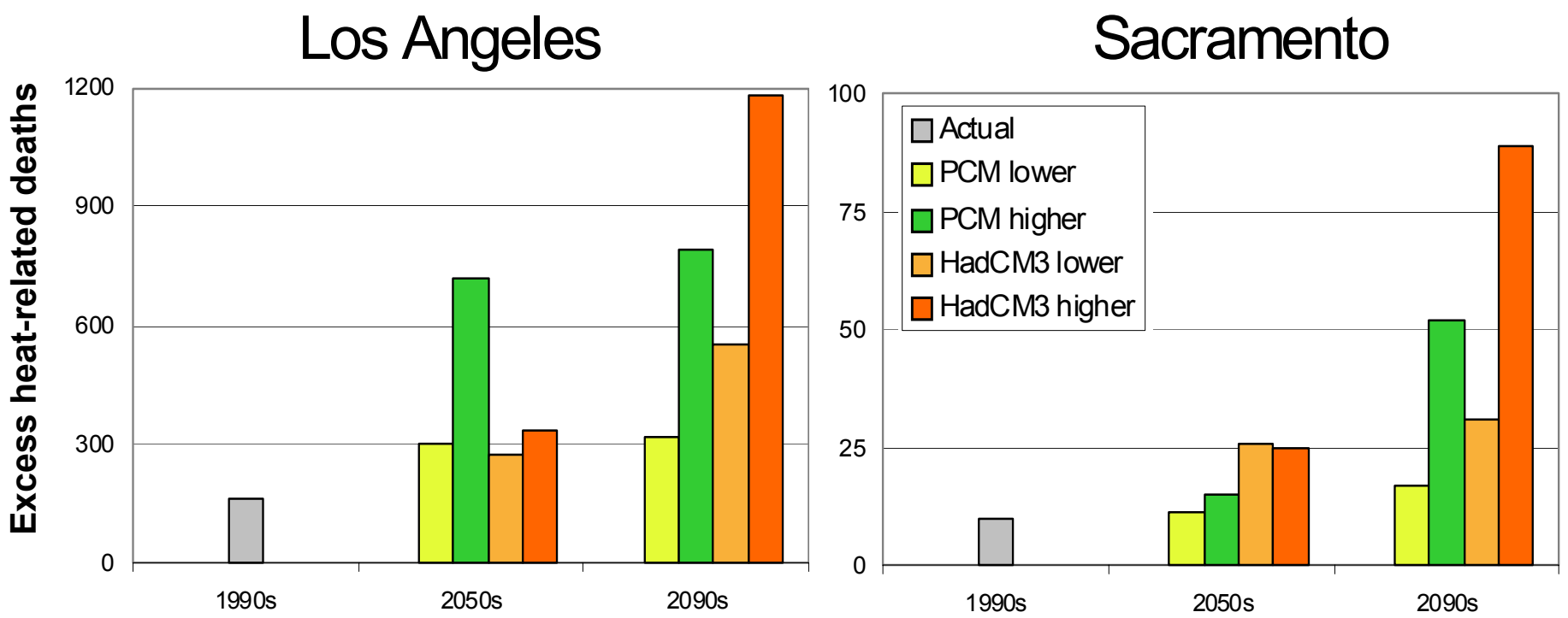
Additional Heatwave days/year

2090s



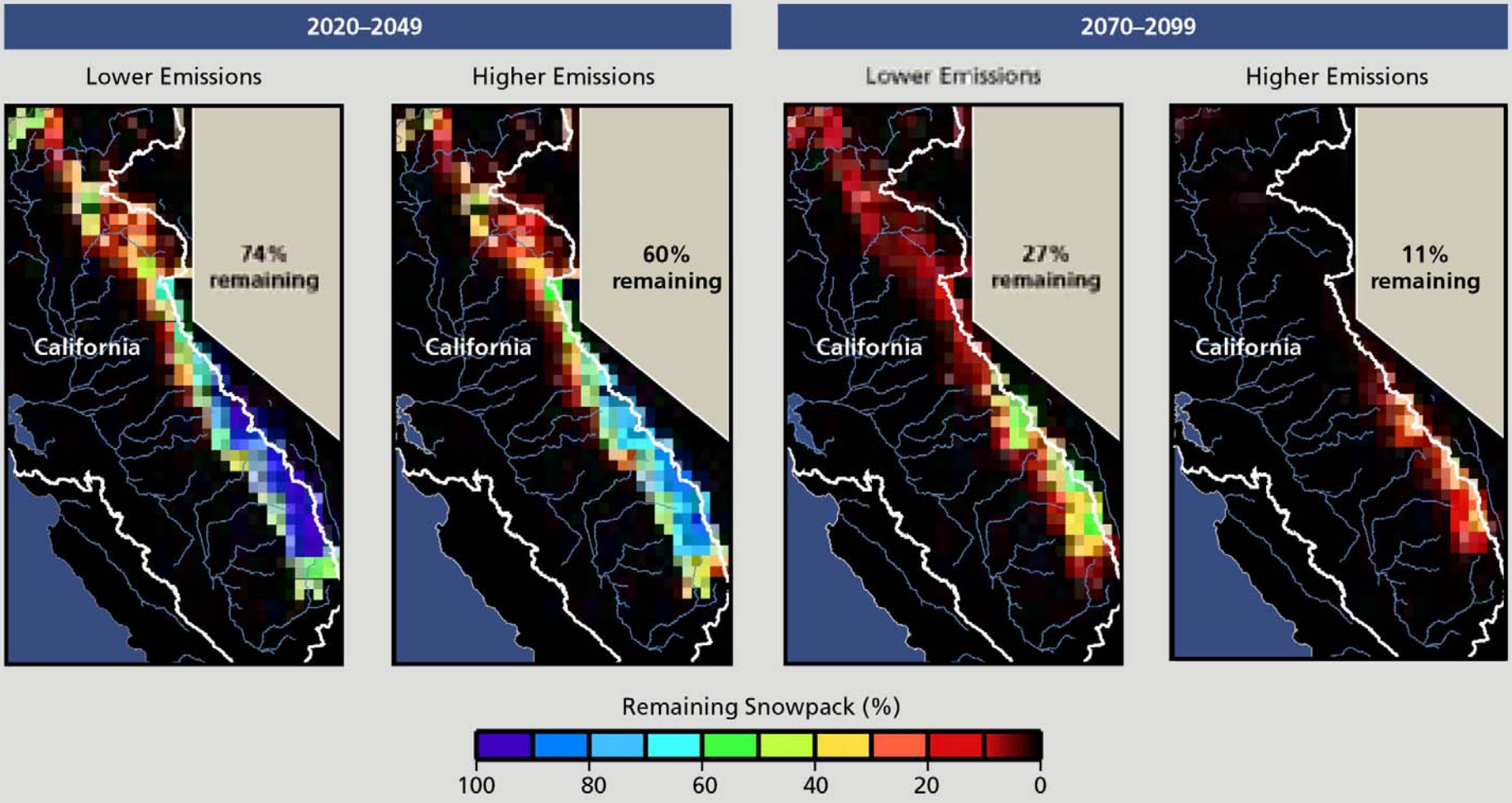
Increasing Heat-Related Mortality

Average Annual Deaths



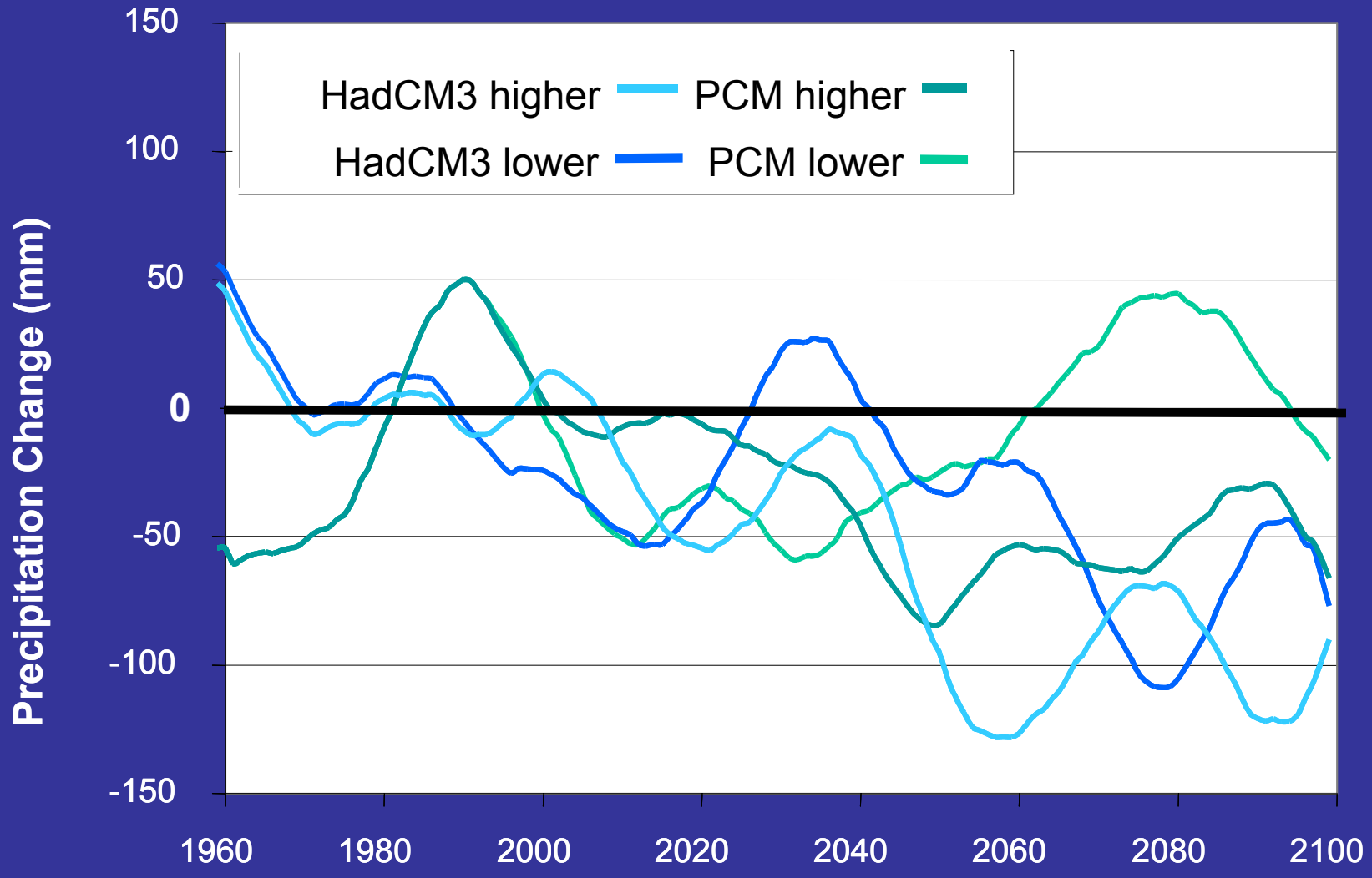
Diminishing Sierra Snowpack

% Remaining, Relative to 1961-1990



Precipitation Projections

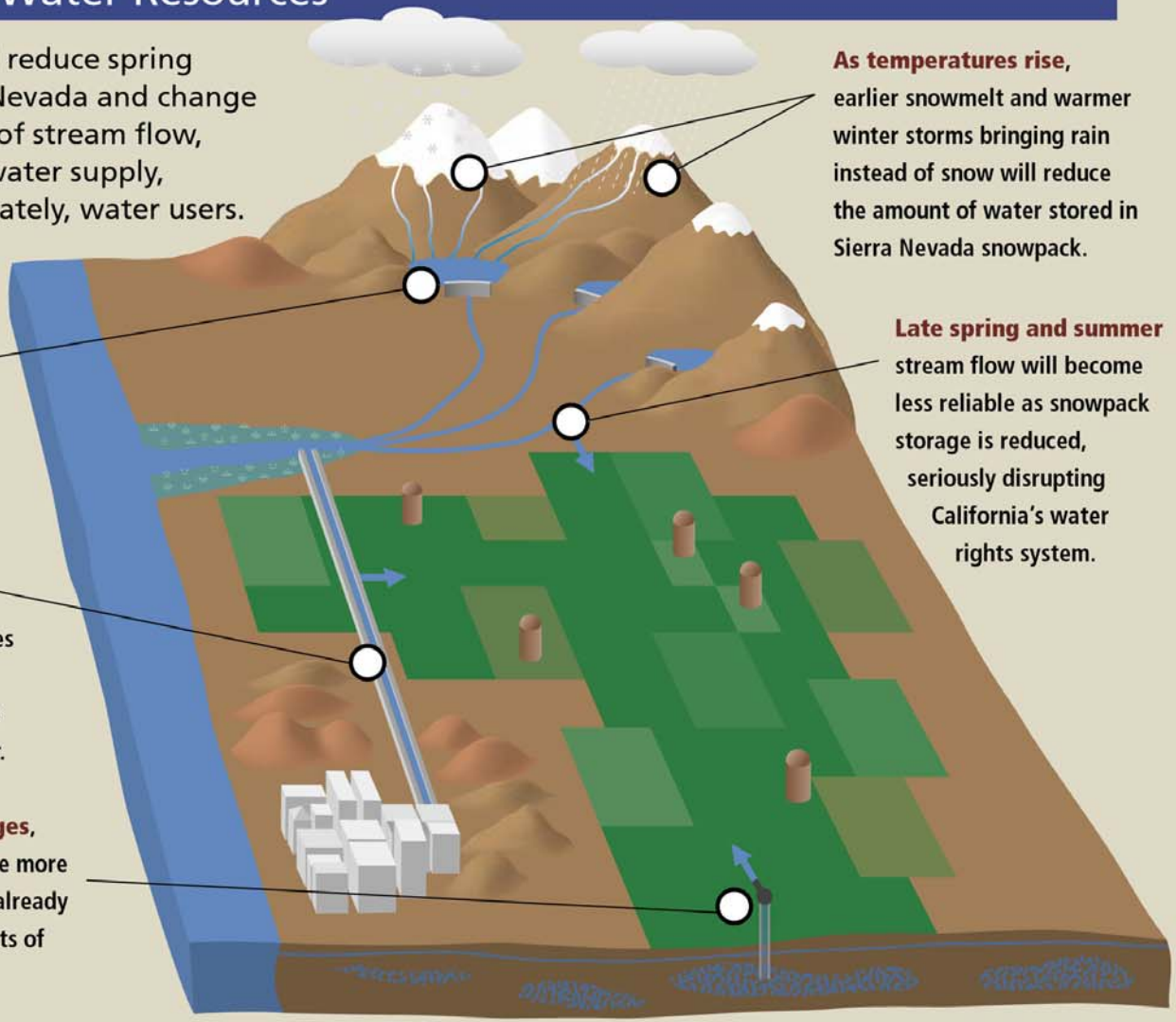
Statewide, Winter



Impacts on Water Supply

Snowpack and Water Resources

Rising temperatures will reduce spring snowpack in the Sierra Nevada and change the amount and timing of stream flow, with consequences for water supply, management, and ultimately, water users.



As temperatures rise, earlier snowmelt and warmer winter storms bringing rain instead of snow will reduce the amount of water stored in Sierra Nevada snowpack.

Reservoir managers will face an increasingly difficult choice between capturing winter runoff for later use and maintaining space for flood control.

Late spring and summer stream flow will become less reliable as snowpack storage is reduced, seriously disrupting California's water rights system.

Agricultural and urban water users will likely face more frequent water shortages as stream flow becomes less reliable and droughts become more frequent and last longer.

During water shortages, farmers are likely to use more groundwater, which is already overdrawn in many parts of the state.

Illustration: Michael Snow/Snow Creative

Decreasing Wine Grape Quality

Temperature Impacts

	1961-1990	2070-2099			
	Current Conditions	LOWER (B1)		HIGHER (A1fi)	
		PCM	HadCM3	PCM	HadCM3
Wine Country	Optimal (mid)	Impaired	Marginal	Impaired	Impaired
Cool Coastal	Optimal (low)	Optimal (mid-high)	Optimal (mid-high)	Optimal (high)	Impaired
Northern Central Valley	Marginal	Impaired	Impaired	Impaired	Impaired

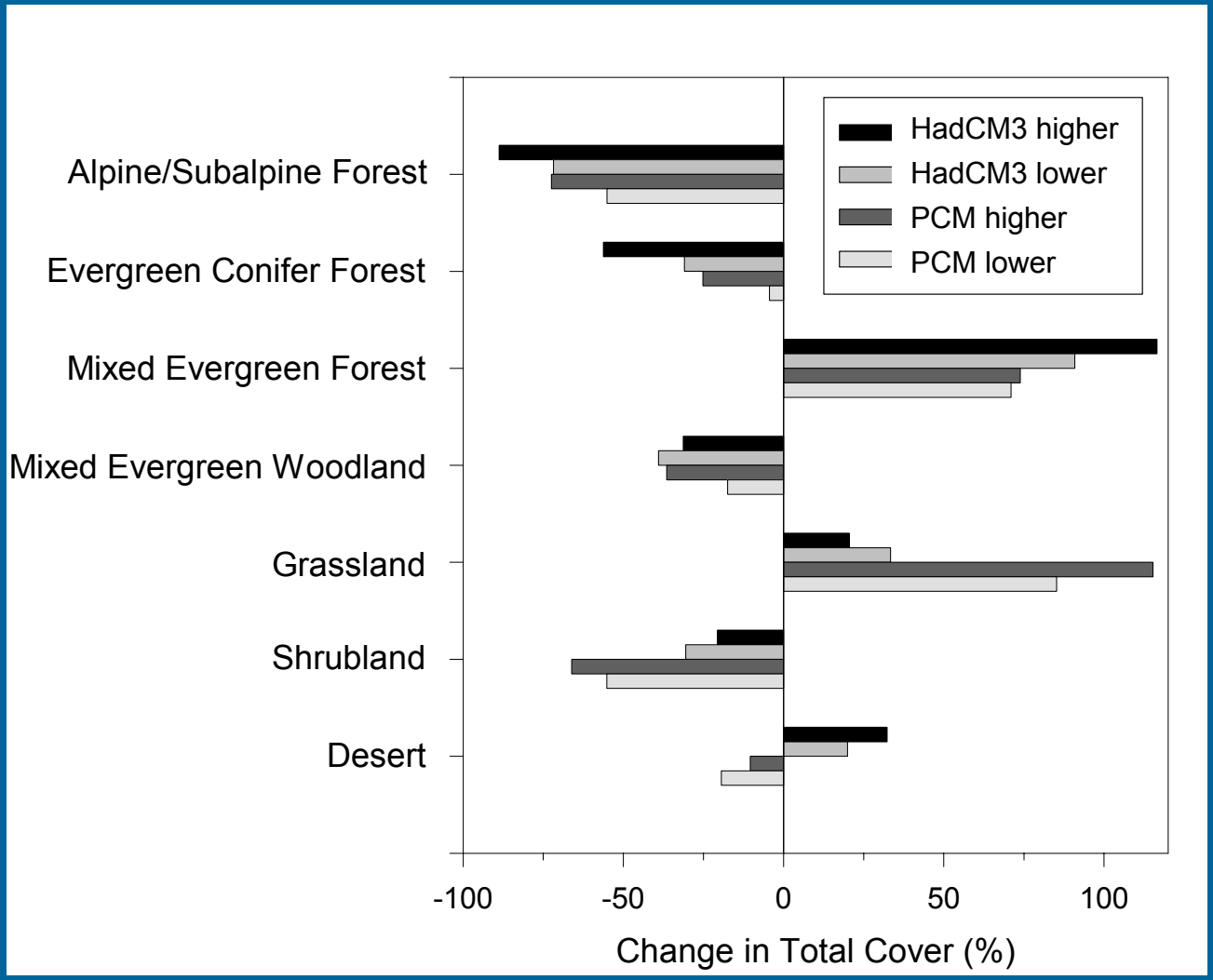
Wine Country (Sonoma, Napa Counties)
Cool Coastal (Mendocino, Monterey Counties)
Northern Central Valley (San Joaquin, Sacramento Counties)

Changes in Vegetation Distribution

2070-2099, relative to 1961-1990

Temperature-driven

Fire-mediated



California Climate Projections

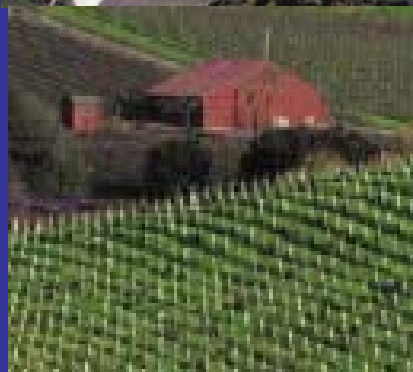
Summary: End of Century

- Temperature increases greater than previously predicted
- Higher emissions yield higher summer temperatures
  - "Higher scenario" summer: + 8.5 to 18° F
  - "Lower scenario" summer: + 3.5 to 9° F
- Heat waves 2-5 times more common, more intense, and longer lasting
- Precipitation variable, with trends towards slight decrease

Impacts on Key Sectors

Summary: End of Century

- Substantial impacts under both emissions scenarios
- Impacts and adaptation costs increase with higher emissions
- Heat-related deaths in 5 study cities
  - Increase 2-4 times in lower emissions
  - Increase 3-6 times in higher emissions
- Sierra snowpack loss
  - 70-90% in higher scenario and
  - 30-70% lower scenario
- Lower emissions pathway is not a floor; higher emissions pathway is not a ceiling.



Managing Climate Change in California

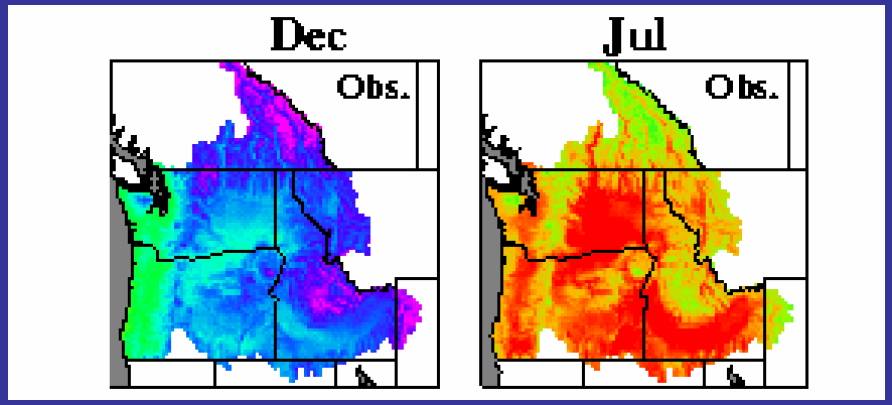
- Reduce emissions of heat-trapping gases
  - Transportation accounts for 49% of $C0_2$ emissions
  - Electricity accounts for 30% of $C0_2$ emissions

- Minimize pressures on the environment
  - reduce fire risk in forests
  - Protect natural floodways
  - Reduce encroachment on sensitive ecosystems
- Prepare for climatic changes that cannot be avoided
  - Heat warning system
  - Water conservation

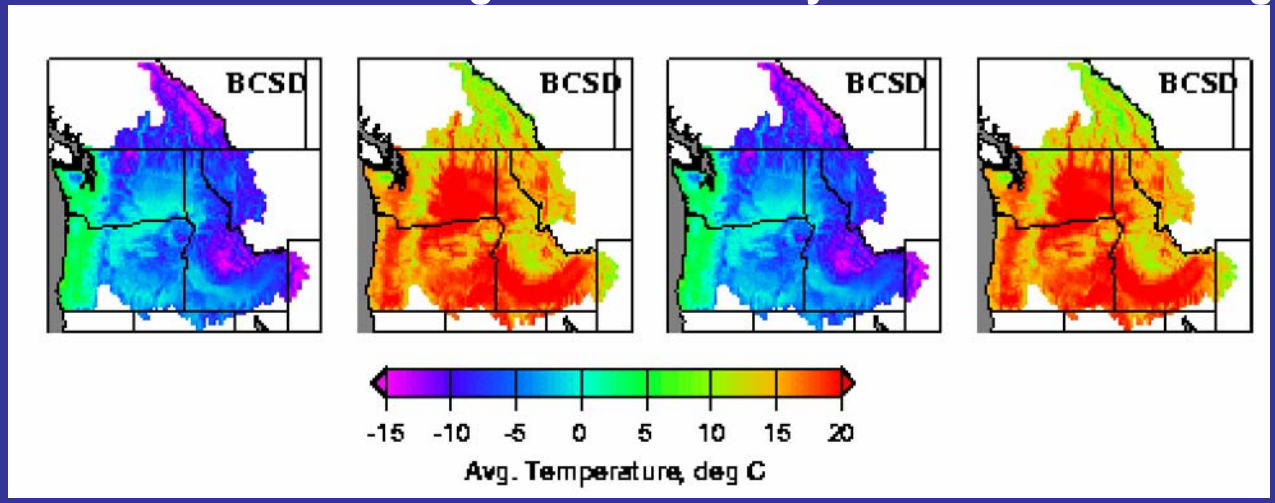
Comparing Historical Observations with Downscaled Climate Model Results

TEMPERATURE

Observed



Statistical Downscaling **Dynamical Downscaling**

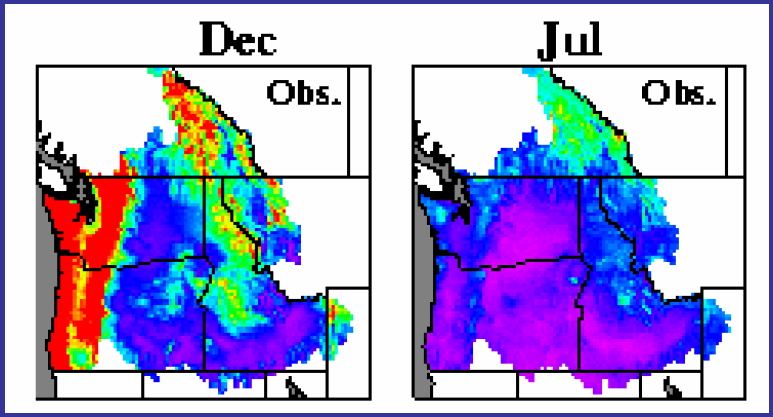


Wood et al., 2003

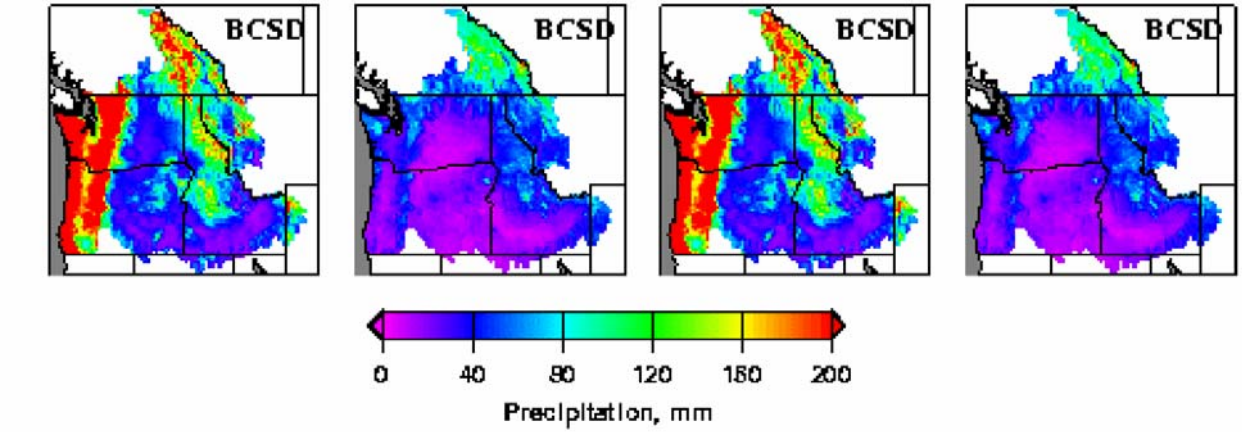
Comparing Historical Observations with Downscaled Climate Model Results

PRECIPITATION

Observed

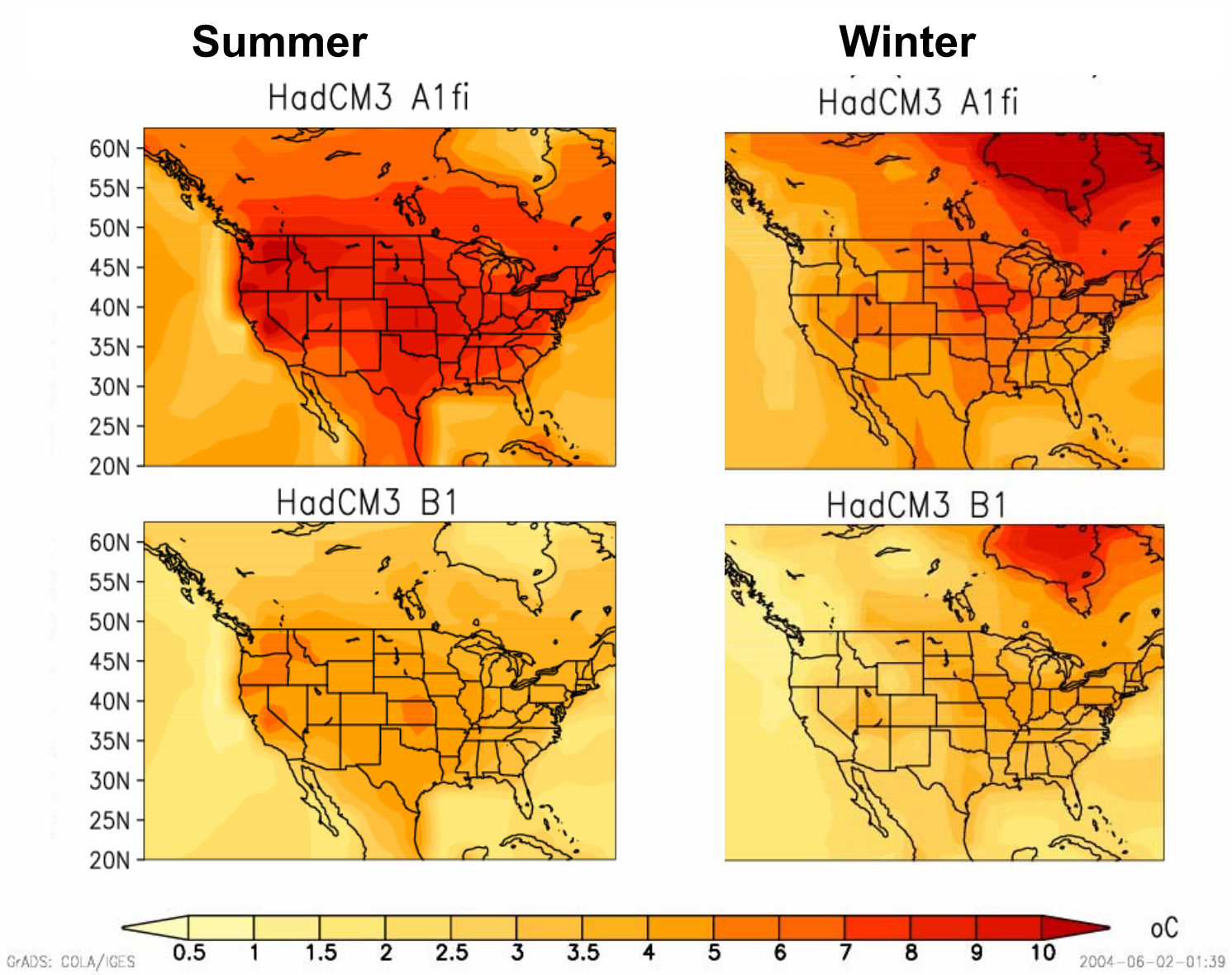


Statistical Downscaling **Dynamical Downscaling**



Wood et al., 2003

Temperature (ºC)



Winter Precipitation